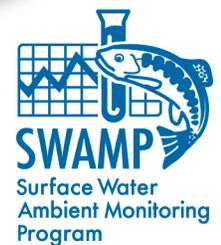
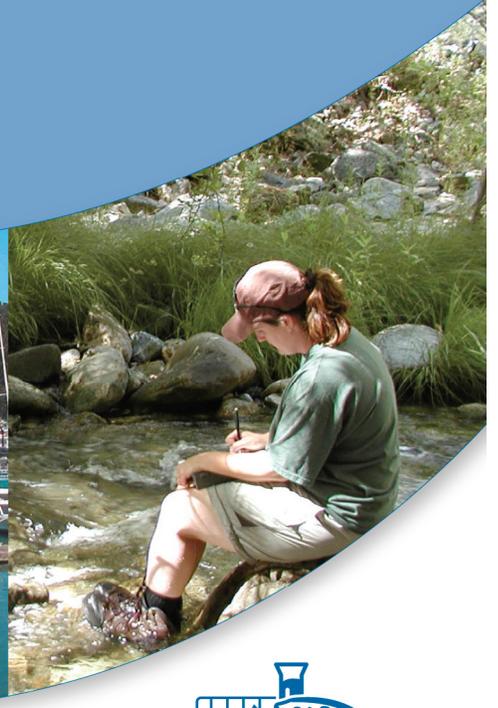
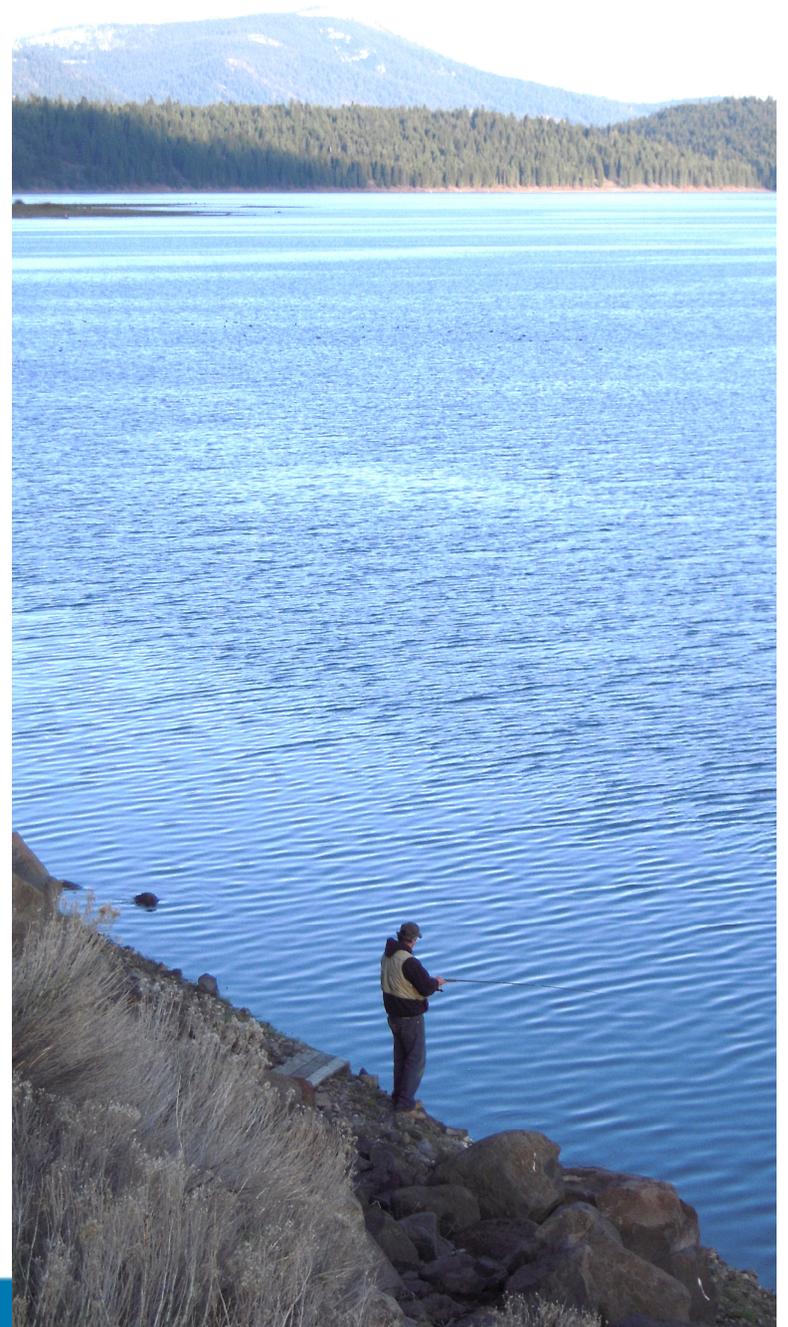


California's Surface Water Ambient Monitoring Program Contaminants in Fish from California Lakes and Reservoirs



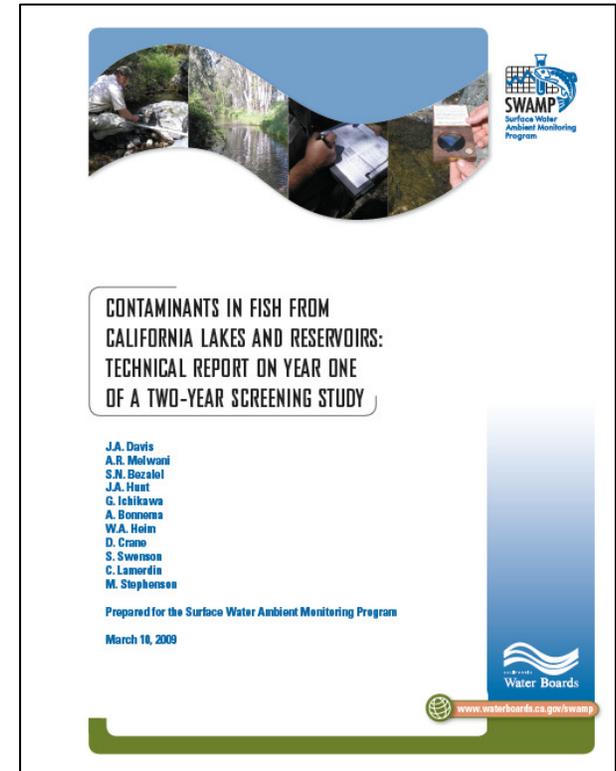
Background

- Problem
 - lack of statewide information on contaminant impacts on the fishing beneficial use
 - lack of safe eating guidelines
 - especially for lakes
- New SWAMP monitoring began in 2007
- \$750,000 to \$1 million per year
- Five-year cycle to cover all water body types, beginning with lakes
- Initial focus on sport fish



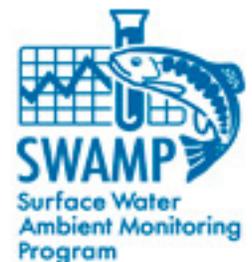
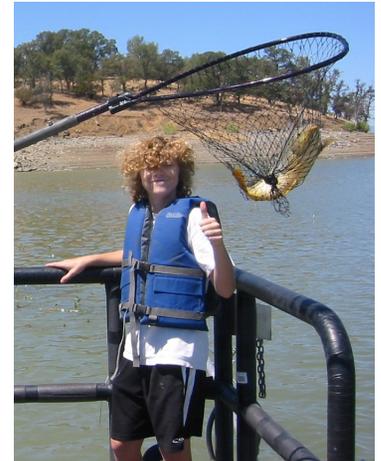
Lakes Survey

- Questions
 1. Condition of California lakes?
 2. Candidates for 303(d) listing?
 3. Candidates for additional sampling?
- Focus on screening of indicator species
- 2007 – 2008



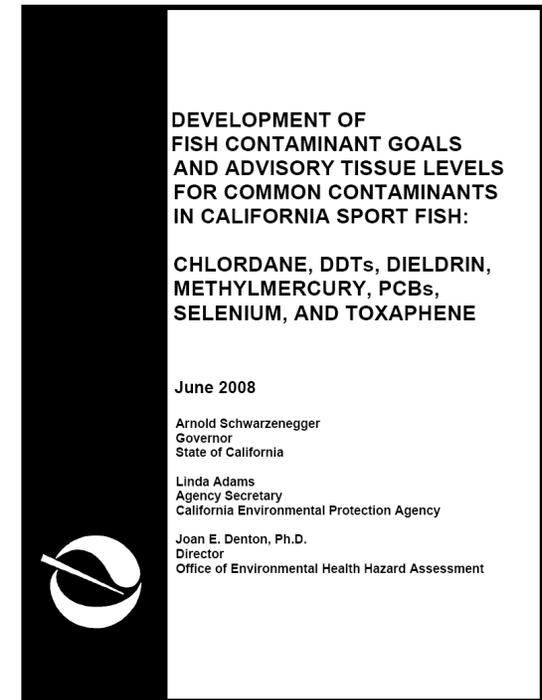
Summary of Results (Year 1)

- California now has one of the best datasets and is making substantial progress in defining the problem
- As in many other states, the problem is widespread
- Mercury poses the greatest concern
- There is significant variation among lakes and among species
- Data from this screening will be valuable in setting priorities for developing TMDLs and for OEHHA in developing safe eating guidelines



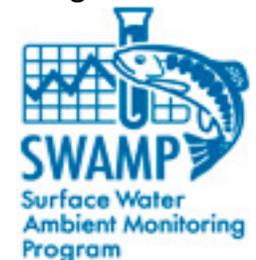
Assessment Thresholds

- New OEHHA thresholds
- Fish Contaminant Goals (FCGs)
 - Purely risk-based
 - 1 serving/wk
 - 1 in 1,000,000 additional cancer risks
 - Useful goals for risk minimization or elimination
- Advisory Tissue Levels (ATLs)
 - Take benefits into account
 - 1 in 10,000 additional cancer risks
 - 0, 1, 2, 3 servings per week categories
 - For OEHHA use in advisories/safe eating guidelines



**Klasing and
Brodberg, 2008**

<http://www.oehha.ca.gov/fish/gtIsv/index.html>



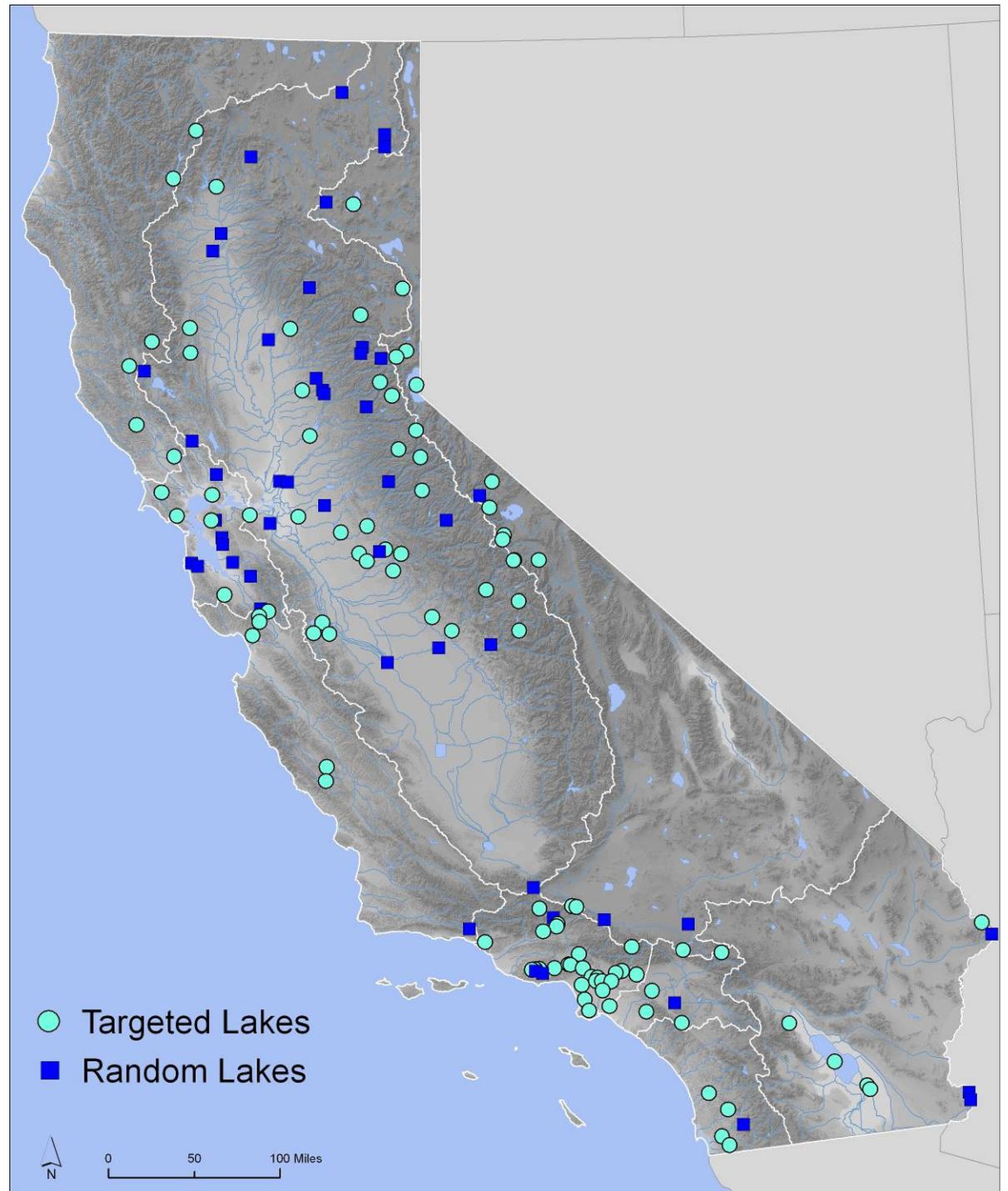
Assessment Thresholds (ppb)

Pollutant	Fish Contaminant Goal	Advisory Tissue Level (3 servings/ week)	Advisory Tissue Level (2 servings/ week)	Advisory Tissue Level (No Consumption)
Chlordanes	5.6	190	280	560
DDTs	21	520	1000	2100
Dieldrin	0.46	15	23	46
Mercury	220	70	150	440
PCBs	3.6	21	42	120
Selenium	7400	2500	4900	15000

Klasing and Brodberg, 2008 <http://www.oehha.ca.gov/fish/gtIsv/index.html>

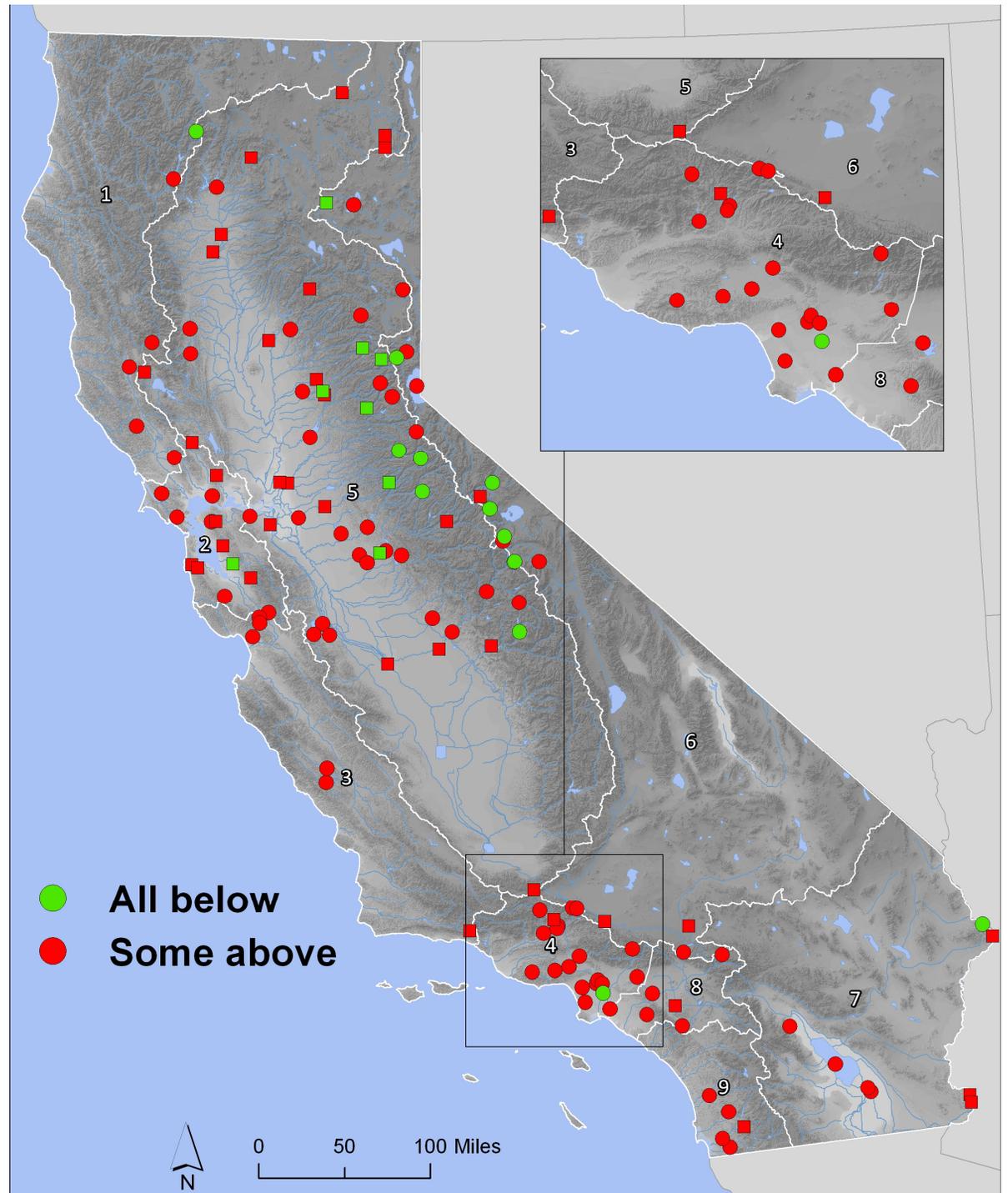
Sampling Locations, 2007

- 152 lakes sampled
- 50 random
- 102 popular
 - 22 extra in Region 4

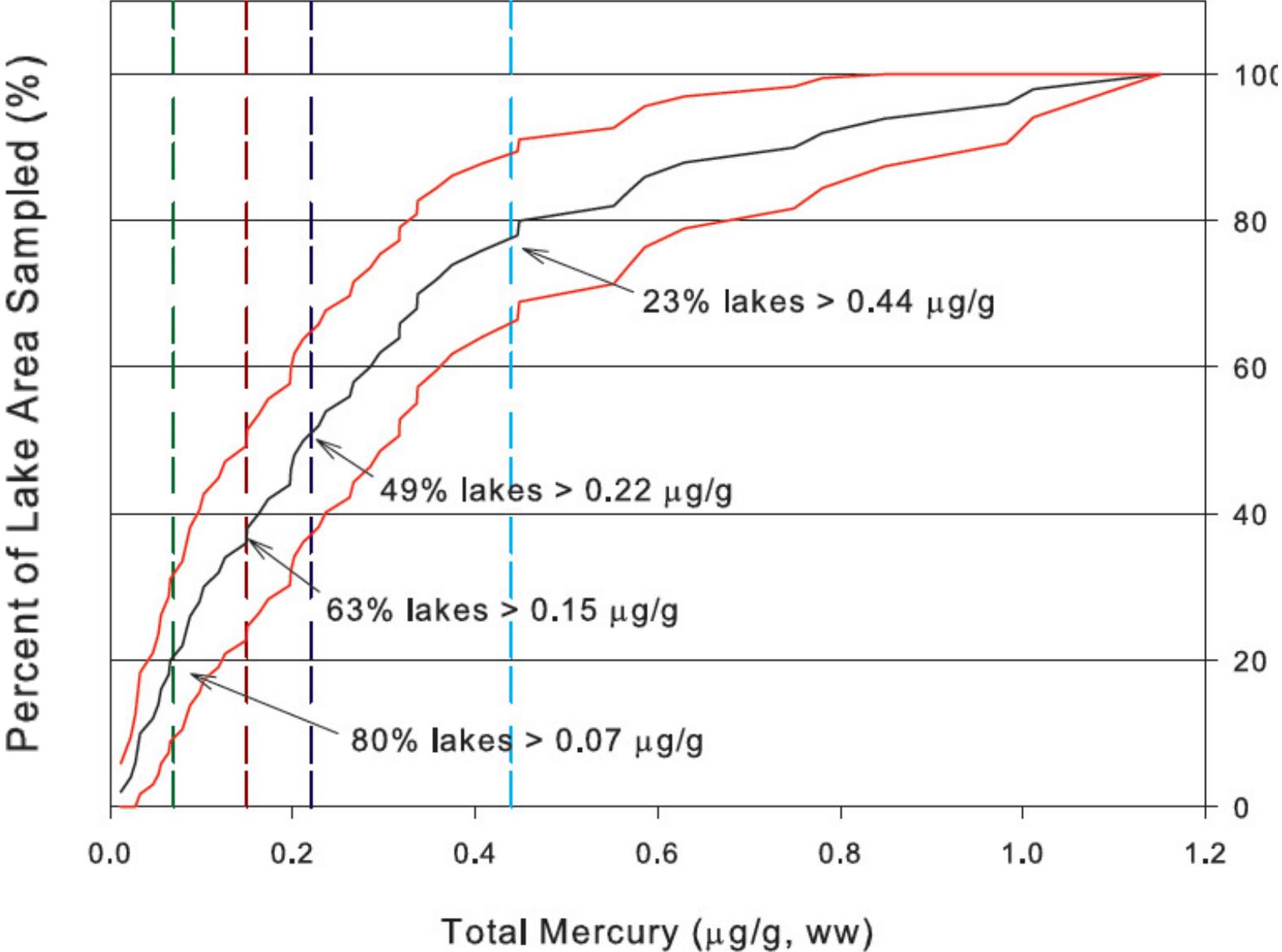


“Clean” Lakes (Based on This Survey)

- 15% of the lakes tested “clean” - all samples below all thresholds
- These lakes are low priorities for further sampling
- 85% were “red”
- Mercury is the main problem at most of these lakes

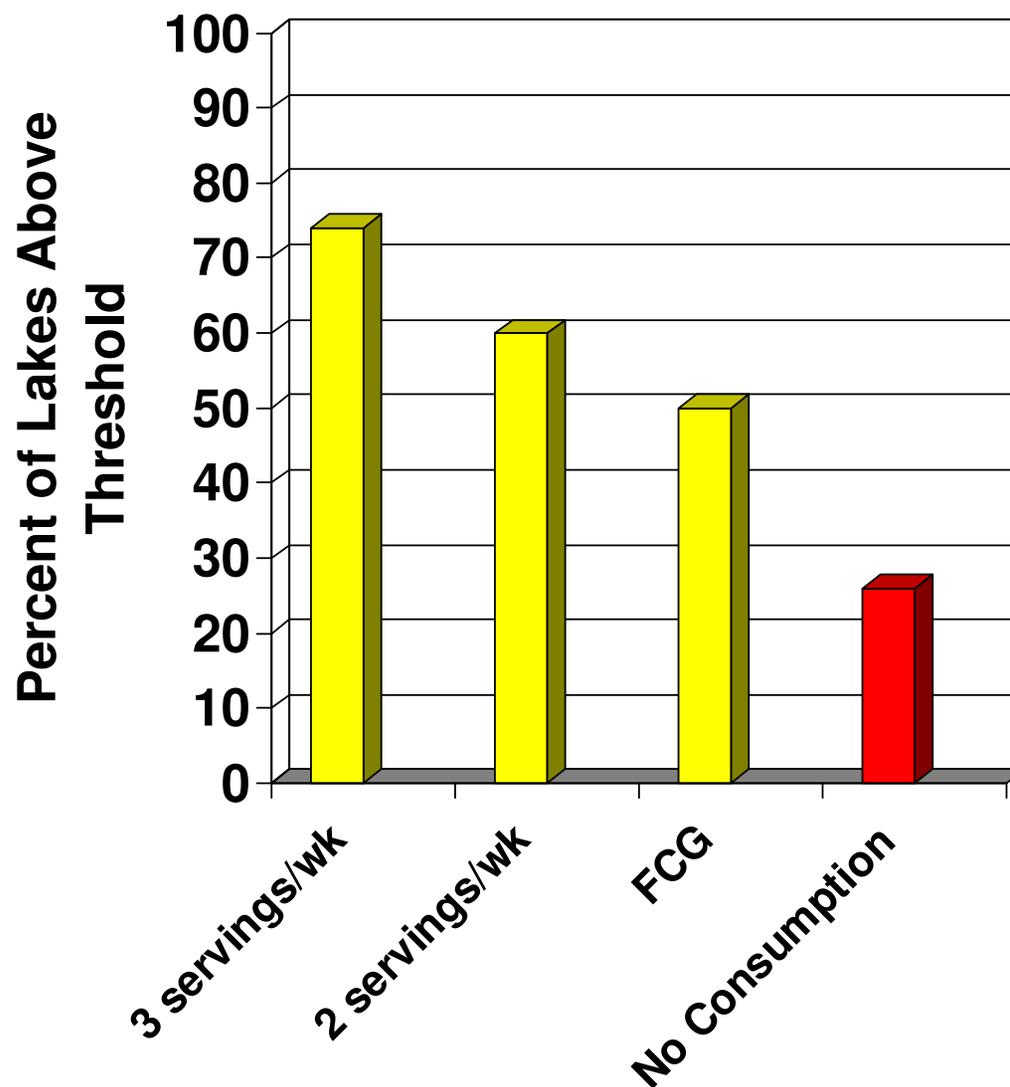


Mercury: Severity of the Problem



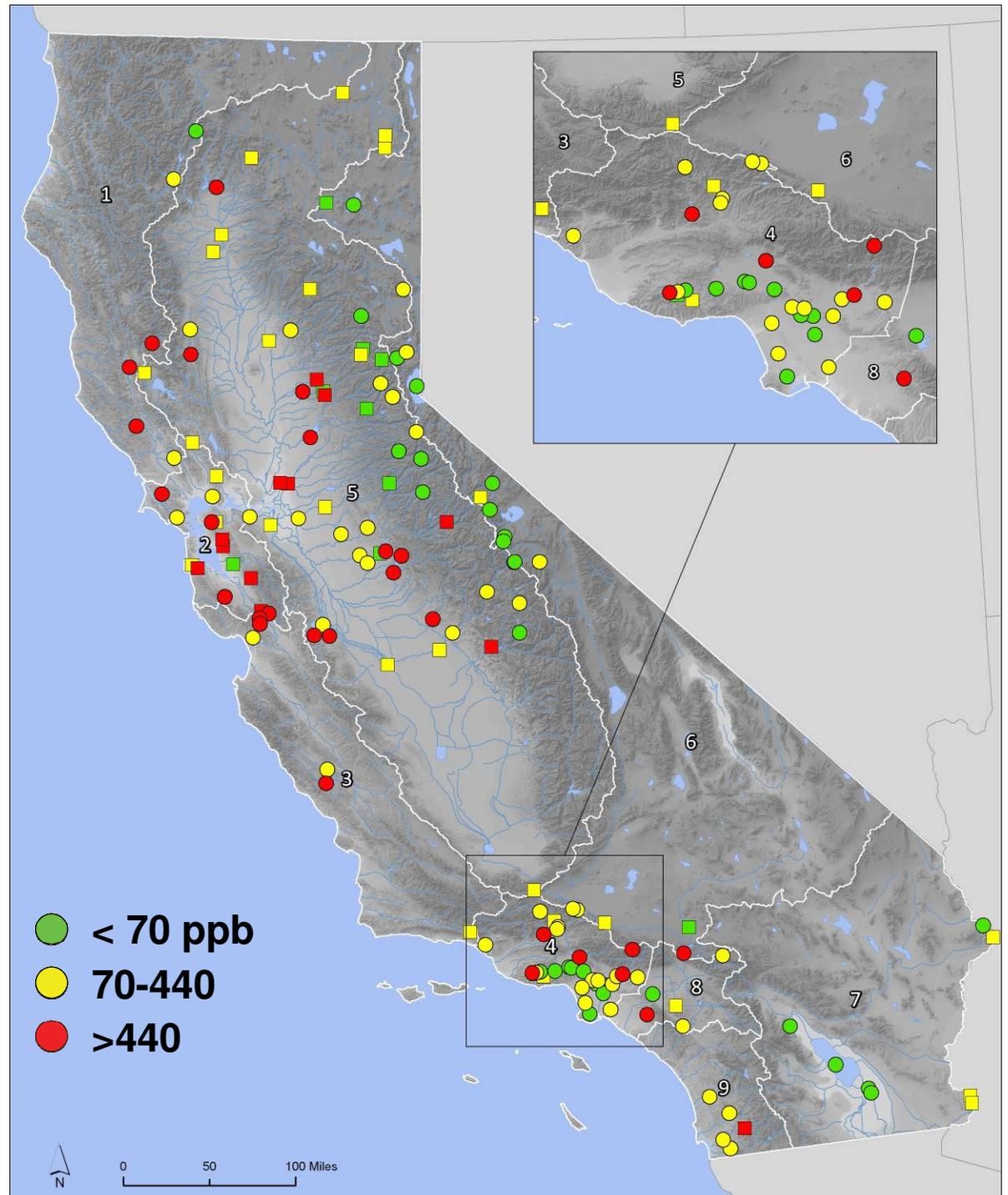
Mercury: Severity of the Problem

- Based on highest species average at each lake
- 26% in no consumption range (> 440 ppb)
- 50% above Fish Contaminant Goal (220 ppb)
- 61% above 2 serving/wk ATL (150 ppb)
- 74% above 3 serving/wk ATL (70 ppb)



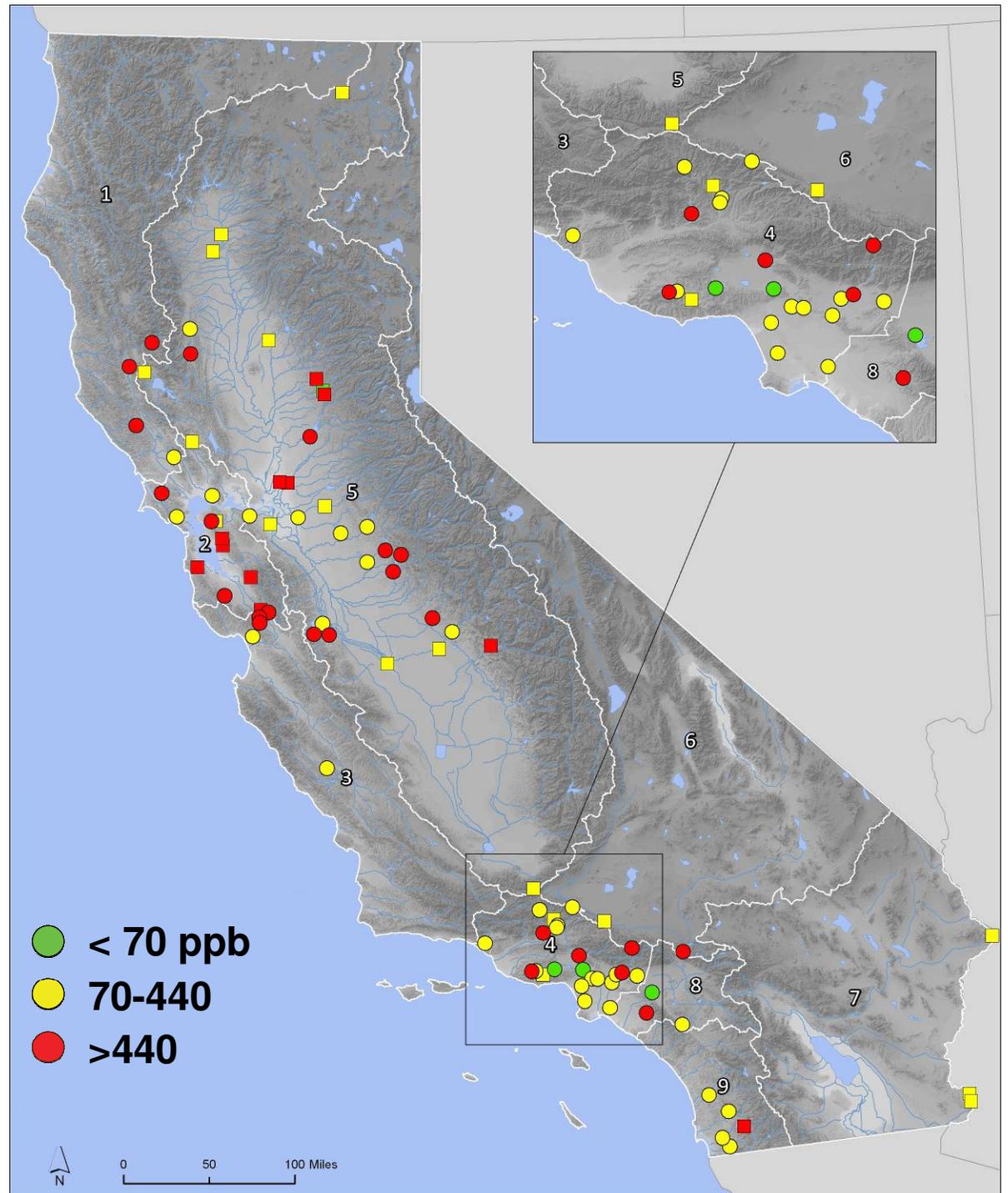
Mercury: Spatial Distribution

- Based on highest species average at each lake
- Low concentrations in some Sierra Nevada and southern CA lakes
- Not just a northern CA problem
- Species distribution has a big influence
- Red lakes a high priority for followup



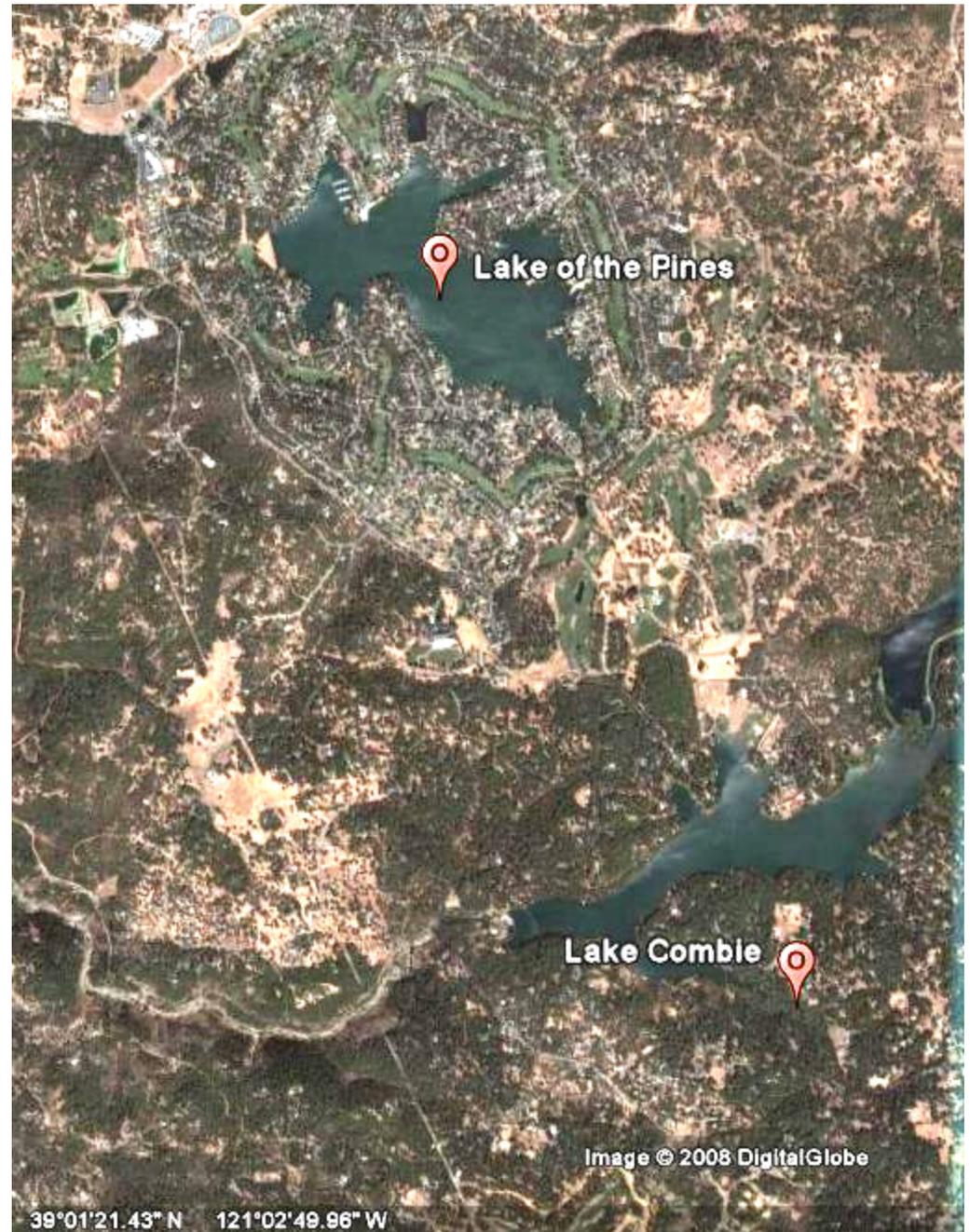
Mercury: Spatial Distribution

- Standard size largemouth bass: apples vs. apples
- One “clean” lake in northern California
- Three clean lakes in southern California
- Sources: mining may not be the only driver

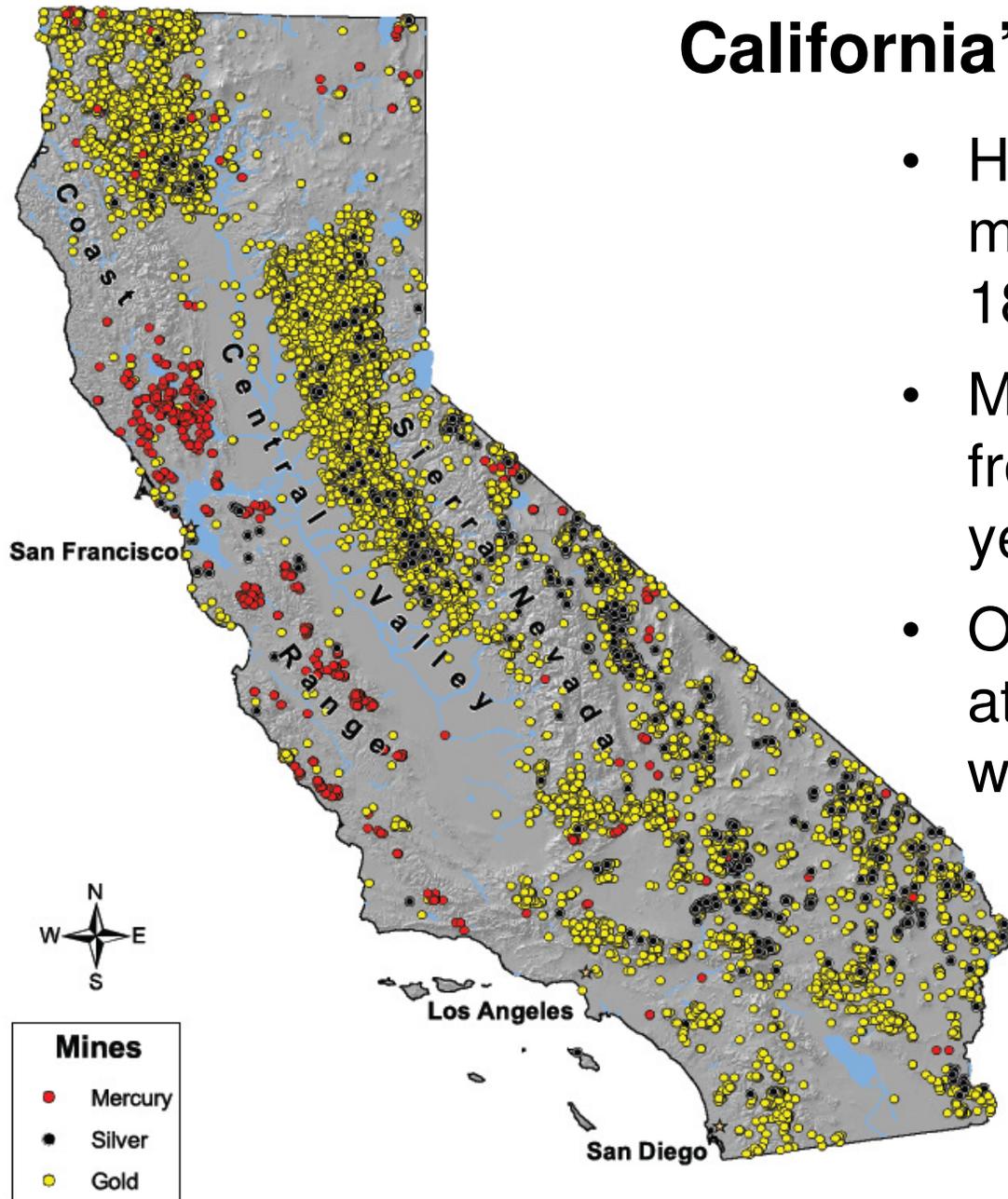


Mercury: Spatial Distribution

- A tale of two NorCal lakes
- 2 miles apart
- Lake of the Pines: 0.07 ppm
- Lake Combie: 0.98 ppm

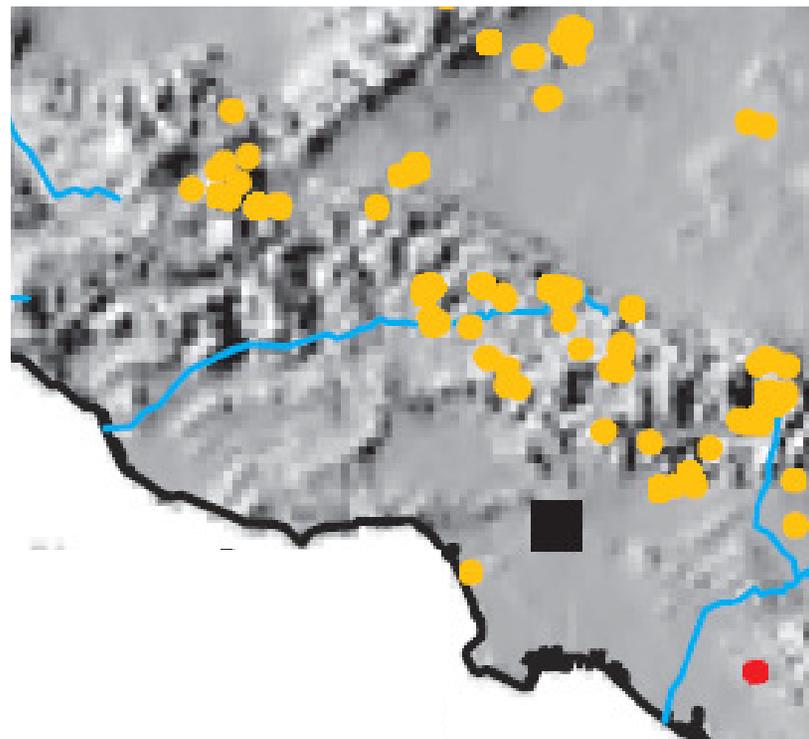
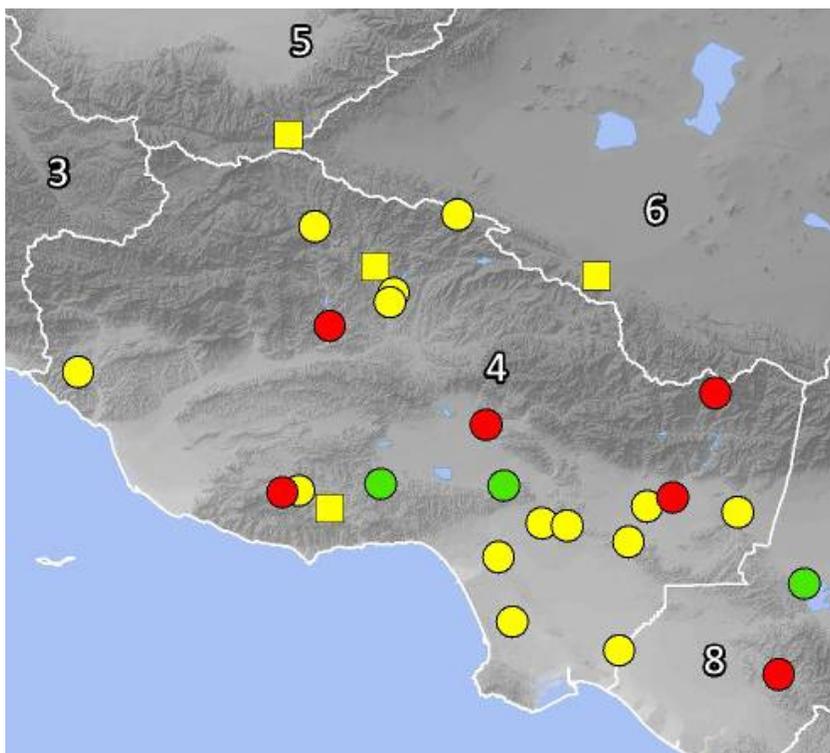


California's Mining Legacy



- Hundreds of gold and mercury mines from mid-1800s
- Mercury contamination from mining persists 150 years later
- Other sources: atmospheric deposition, wastewater, urban runoff

From Wiener and Suchanek (2009).
Ecological Applications 18(8)
Supplement: A3-A11.



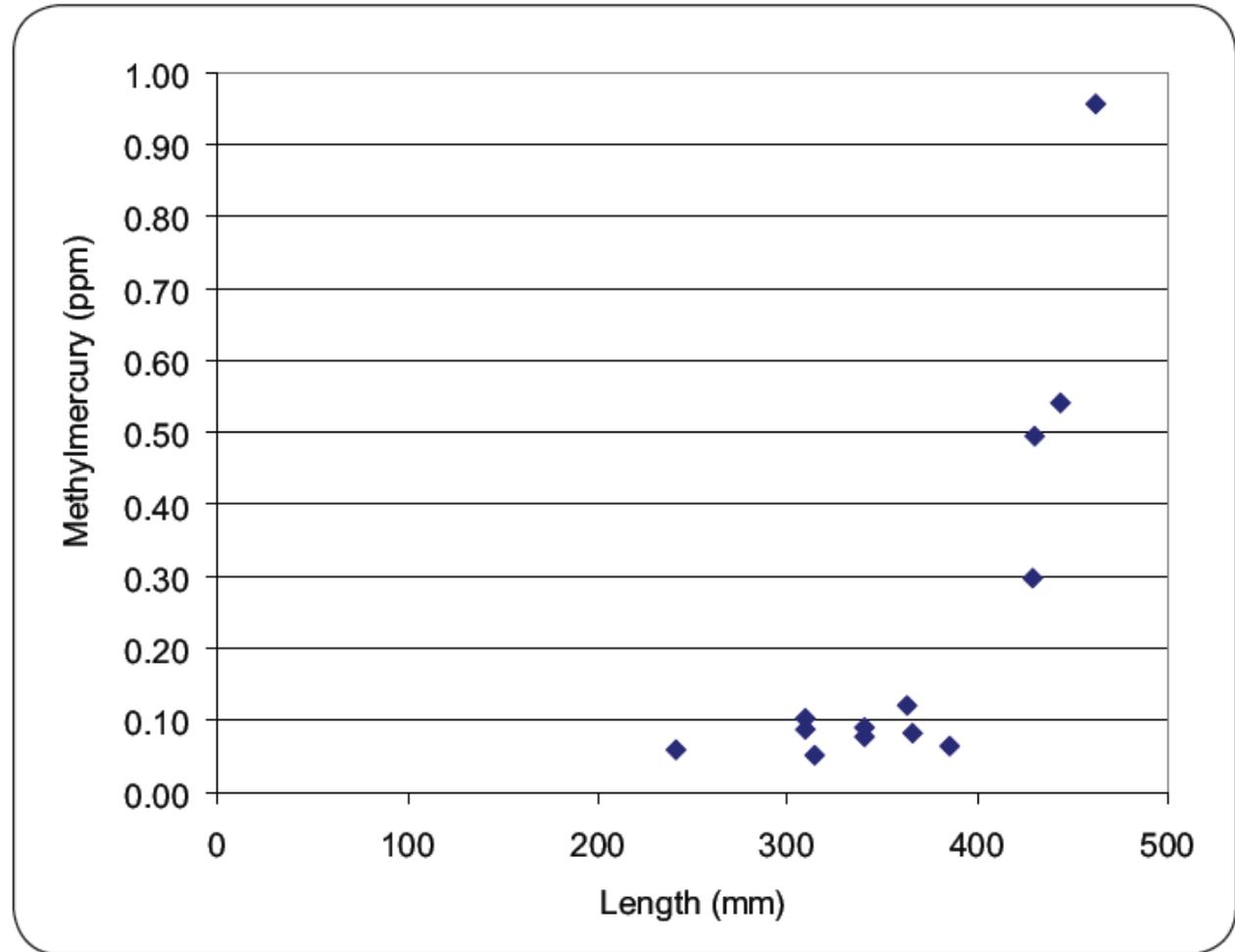
Mercury: Spatial Distribution

- Southern CA has mercury too
- Southern CA had mines too
- Toluca Lake: 0.01 ppm
- Crystal Lake: 0.95 ppm

From Alpers et al. (2005) – Fact Sheet
2005-3014 Version 1.1, Revised October
2005

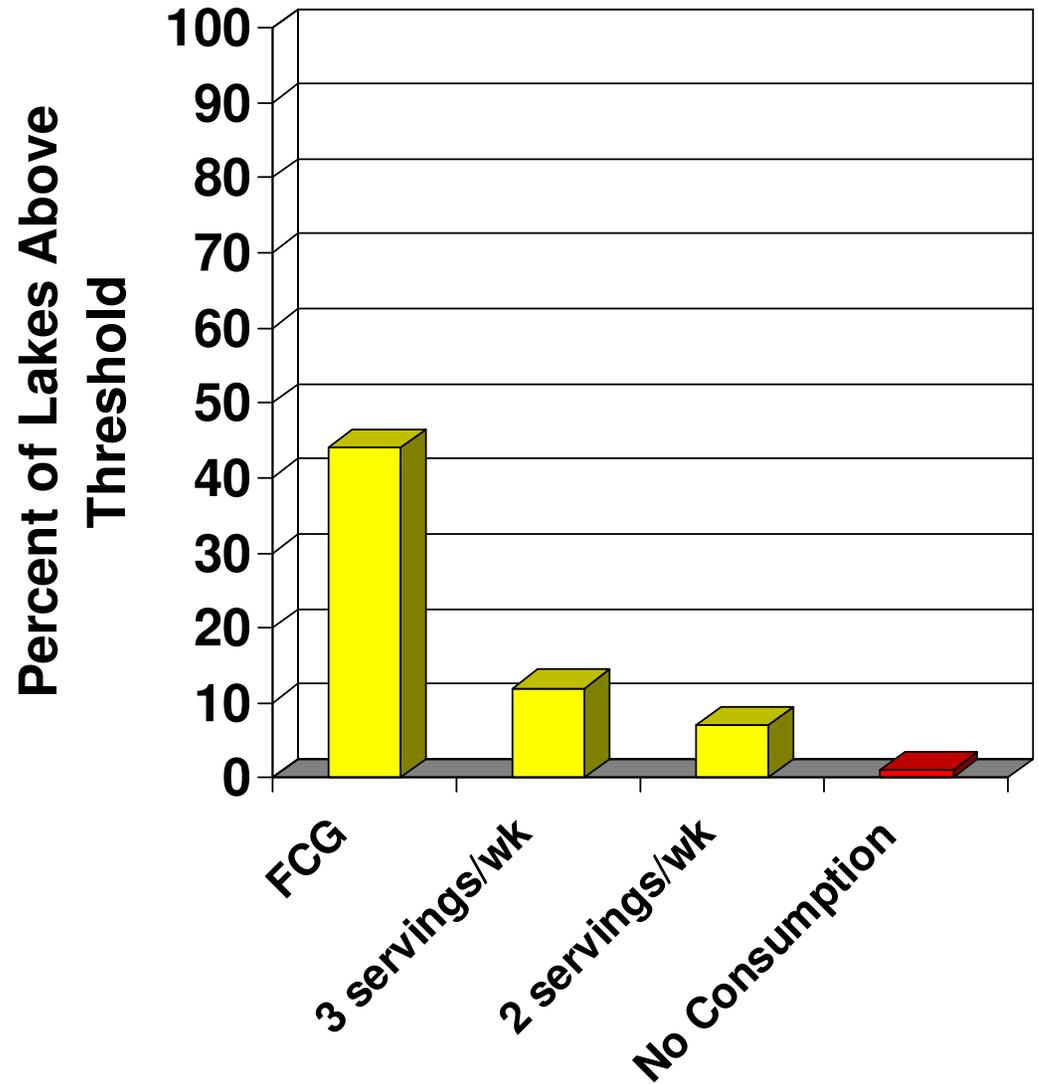
Mercury: High Elevation Lakes

- Brown trout
- Hetch
Hetchy stood out
- Larger (piscivorous) fish from resident trout populations can be high



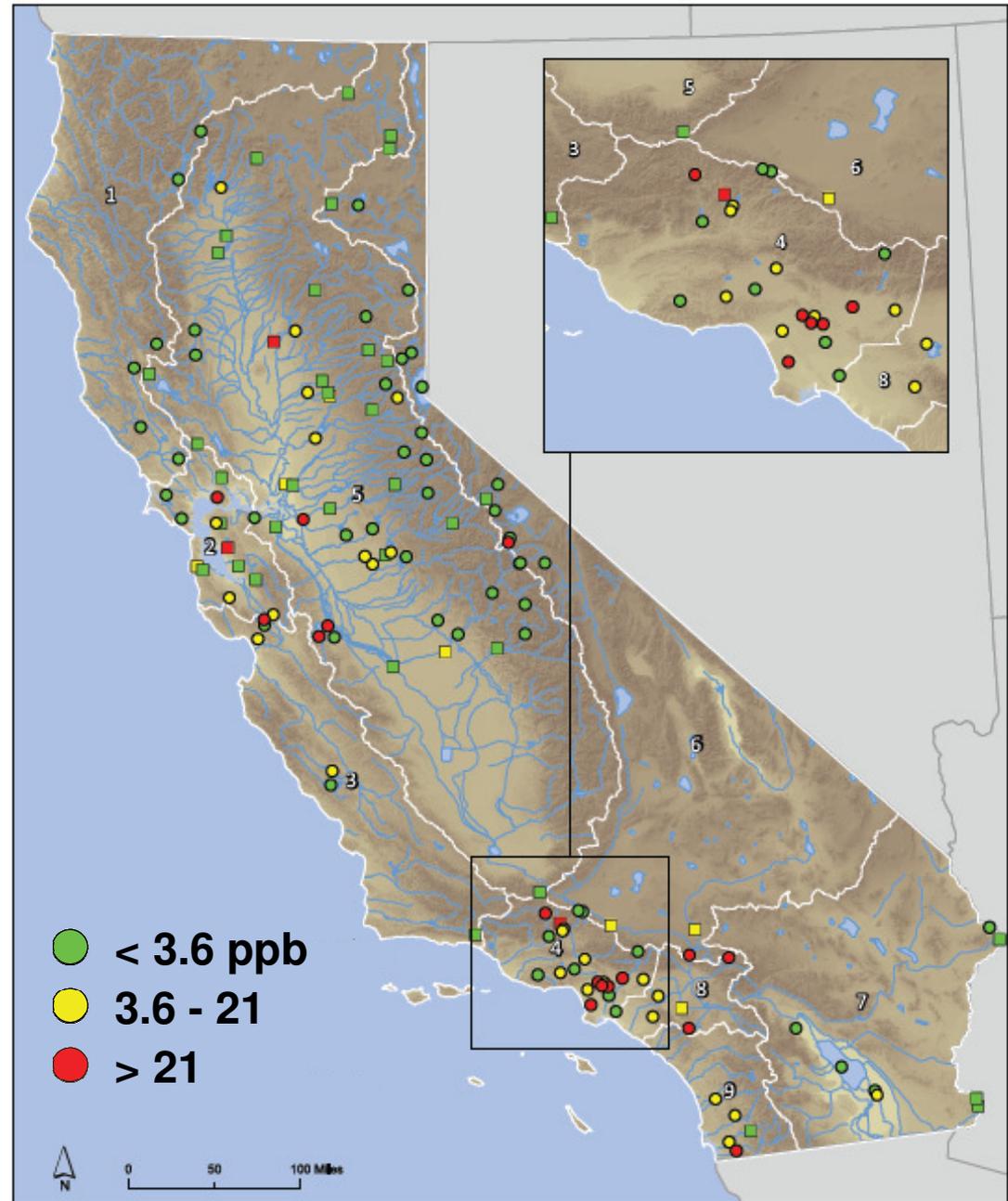
PCBs: Severity of the Problem

- Based on highest species at each lake
- 1% of lakes in no consumption range (>120 ppb)
- 8% above 2 serving/wk ATL (42 ppb)
- 13% above 3 serving/wk ATL (21 ppb)
- 37% above Fish Contaminant Goal (3.6 ppb)



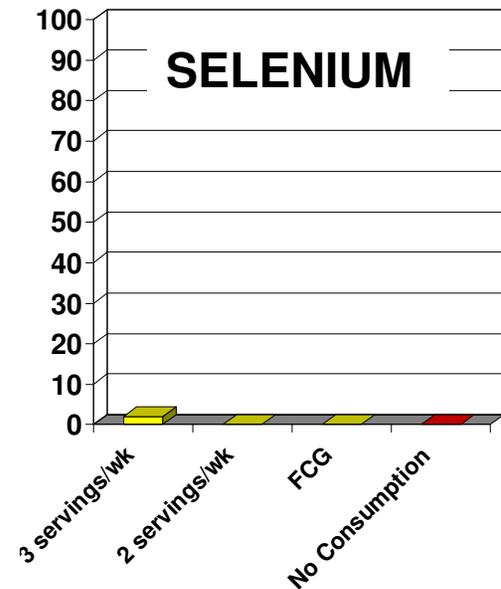
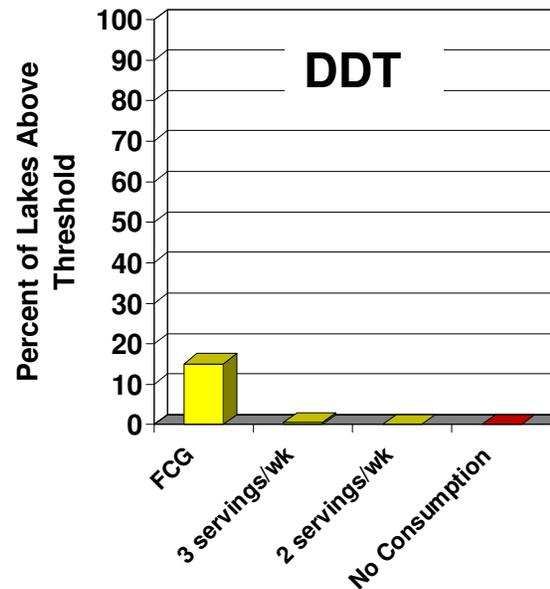
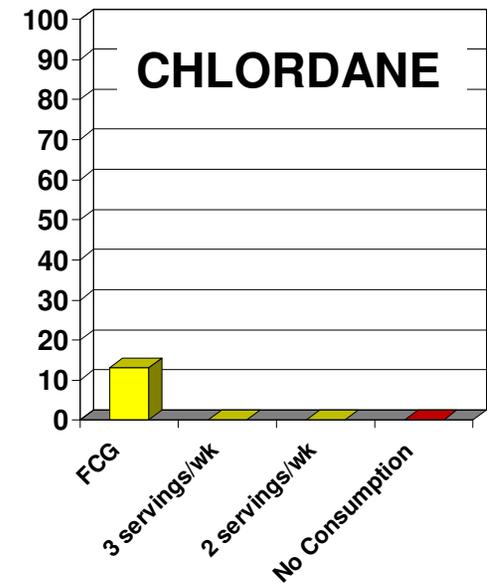
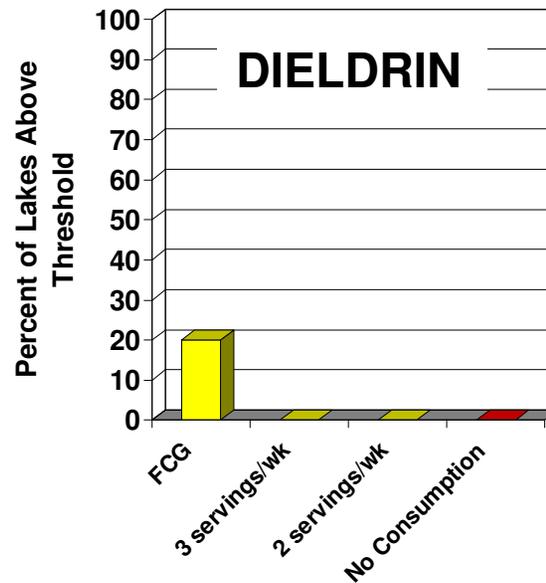
PCBs: Spatial Distribution

- Based on highest species average at each lake
- Note different scale from mercury
- Elevated concentrations across the south
- Some elevated lakes in north



Other Contaminants: Severity of the Problem

- Dieldrin: 21% above Fish Contaminant Goal (0.46 ppb)
- DDT: <1% above 3 serving/wk ATL, 17% above FCG (21 ppb)
- Chlordane: 10% above FCG (5.6 ppb)
- Selenium: 2% above 3 serving/wk ATL (2500 ppb)



Timeline

■ 2009

- Report on Lakes Year 1
- Sampling for Coast Year 1
- Safe to Eat Portal

■ 2010

- Report on Lakes Years 1 and 2
- Sampling for Coast Year 2
- Planning for Rivers and Streams

■ 2011

- Report on Coast Year 1 (SoCal Bight and Region 2/RMP)
- Sampling for Rivers Year 1



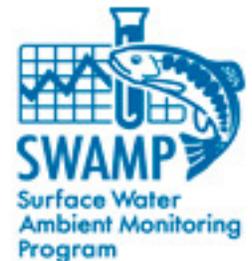
Acknowledgements

The BOG

- Terry Fleming
- Bob Brodberg
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- Autumn Bonnema
- Jennifer Hunt

Peer Review Panel

- Jim Wiener
- Ross Norstrom
- Chris Schmitt





Joseph A. Garcia / Ventura County Star

Servando Arredondo of Fontana and others wait for a bite along the shore at Lake Piru.

